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Editorial

HUMAN HEALTH IMPACT OF BOVINE BETA-CASOMORPHIN-7 OF MILK — A QUESTION FOR MILK PRODUCTS OR OUR BREEDING POLICY ?

Beta-casein comprises around 30% of the total protein contained in cow's milk. Beta-casein may be present as one of the two major genetic variants, A_1 and A_2 in cattle. Although there are at least 13 different variants of the beta-casein protein in cattle population, with any one cow producing milk that will contain either one or two of these 13 variants. The A_1 beta-casein variant releases one opioid peptide Beta-Casomorphin-7 (BCM-7) following normal enzymatic digestion which acts as a histamine releaser, whereas A_2 beta-casein generally does not release it. The major difference between the A_1 and A_2 beta-casein proteins found in a single amino acid at position 67 in a strand of 209 amino acids. A_1 beta-casein has the amino acid histidine at position 67, while A_2 beta-casein is having a proline amino acid in the same position. The bovine beta-casein gene is part of a cluster of 4 casein genes (alpha-S_1-casein, alpha-S_2-casein, beta-casein and kappa-casein) located on chromosome number six. Release of BCM-7 from the hydrolyzed raw or processed milk is related to the beta-casein A_1 allele, irrespective of a lactation period. Processing of raw milk at high temperatures is having only a little effect.

Human milk, goat milk, sheep milk and milk of other species contain beta-casein which is 'A_2 like', as they have amino acid proline at the equivalent position in their beta-casein amino acid chains. The A_1 beta-casein protein derived BCM-7 can affect many opioid receptors in the endocrine, nervous and immune system. Infants are having more chance of absorption of BCM-7 through their comparatively immature gastro-intestinal tract than the adults who are having a chance of showing local reaction in the intestine.

BCM -7 is also considered to be an oxidant of Low Density Lipoprotein (LDL) which may have some role in formation of arterial plaque. It is reported that BCM-7 may function as an immunosuppressant and impair tolerance to dietary antigens in the gut immune system which may contribute to the onset of Type 1 Diabetes. BCM-7 has been implicated as a **potential etiological factor in Type 1 Diabetes mellitus, Coronary Heart Disease, Arteriosclerosis, Sudden Infant Death Syndrome and also related with some neurological conditions such as Autism or Schizophrenia.** A_2 beta-casein has not been implicated for these conditions.

Existing cattle population are identified as two separate species: *Bos taurus*, the European

or “taurine” cattle (including similar types from Africa and Asia) and our native *Bos indicus*, the “*zebu*”, most of which are referred as “ *Deshi*”, or “*Non descriptive*” cattle.

A_2 beta-casein is found in all Western, African and Indian cattle and water buffalo. A_1 beta-casein is carried only by the cows of European breeds, all of which belong to the subspecies *Bos taurus*. Beta-casein allele frequency in indigenous Indian cattle (*Bos indicus*) and buffalo breeds reported to have 99 to 100% presence of the A_2/A_2 genotype and A_1/A_1 genotype is absent among them. So, almost all the indigenous Indian cow and buffalo breeds are homozygous for the A_2 beta-casein allele. The picture is different among European breeds. The Holstein carries the A_1 and A_2 beta-casein alleles almost in equal distribution. Jersey has an A_2 allele frequency somewhat higher than this. But some Jersey cows carry one “B” beta-casein allele which can release of BCM-7 far more.

So, we can at least safely conclude that the milk of our native cow is far safer than the milk of Jersey or such other Europian breed of cattle. A breed is developed by exercising continuous selection pressure on a particular type of animal showing desirable characteristics for long generations. The characters are identified considering several factors including the conditions of a geographical area. The Europian countries along with some other countries like Australia developed cattle breed in this way. But we are importing germplasm of exotic cattle breed (like that of Jersey, Holstein etc., all are *Bos taurus*) and crossbreeding our native “*Deshi*” or “*Non-descriptive*” cattle with this, castrating the native bulls. This process is in practice for last a few decades and now it is very difficult to find even sufficient number of our native cattle in many agro-climatic areas of our country for development of any new breed from them.

Dr. S. Pattanayak

Associate Editor
Exploratory Animal and Medical Research

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